Study of left ventricular functions in asymptomatic obese individuals by 2D-echocardiography

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Abstract Background: Coronary artery disease is the most common type of heart disease. Obesity is one of the important risk factor for coronary artery disease. Obesity increases adverse cardiac events in many ways. Most individuals with coronary artery disease show no evidence of disease for decades. Aim: To study left ventricular functions in asymptomatic obese individuals by 2D-Echocardiography. Material and Methods: A total of 50 asymptomatic obese individuals were studied for left ventricular function by 2D echocardiography. Their anthropometric profile and measurements were taken as per standard procedure. Results: Left ventricular hypertrophy was found in 16 (32%) subjects, diastolic dysfunction was found in 5 (10%) subjects and Left ventricular hypertrophy and diastolic dysfunction was found in 2 (4%) subjects. Conclusion: As BMI increases there is increase in incidence of coronary artery disease in asymptomatic obese individuals. So, regular screening by using non-invasive 2D Echocardiography is recommended in these individuals.

Key Words: Obese, Coronary artery disease, asymptomatic, 2D Echocardiography, left ventricular function

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INTRODUCTION

Coronary artery disease (CAD) is the most common type of heart disease. The disease is caused by plaque building up along the inner walls of the arteries of the heart, which narrows the arteries and reduces blood flow to the heart. While the symptoms and signs of coronary artery disease are noted in the advanced state of disease, most individuals with coronary artery disease show no evidence of disease for decades as the disease progresses before the first onset of symptoms, often a "sudden" heart attack, finally arises.¹ Obesity is one of the important risk factor for coronary artery disease. Obesity increases adverse cardiac events in many ways. These may be indirectly mediated through risk factors associated with metabolic syndrome like dyslipidemia, hypertension, and glucose intolerance, or effects from sleep disorders associated with obesity. Risk factors often occur in clusters and may build on one another, such as obesity leading to diabetes and high blood pressure. When grouped together, certain risk factors put an individual at a greater risk of coronary artery disease.^{2,3} The present study was conducted to study left ventricular functions in asymptomatic obese individuals by 2D-Echocardiography.

MATERIAL AND METHODS

This cross sectional descriptive study included 50 asymptomatic obese individuals attended outpatient Department of Medicine over a period of two years. Institutional Ethical Committee permission was obtained prior to the commencement of this study. Informed written consent was taken from each individual.

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Inclusion criteria

- Age 18 years.
- Sex-Both males and females.
- Individuals with body mass index more than 30.
- Patients with history of hypertension.

Exclusion criteria

- Patients with known ischemic heart disease
- Patients with known diabetes mellitus.

Detailed history of each patient was recorded. Clinical examination was done and relevant investigations were done.

Anthropometric profile and measurements

- Body weight: It was determined with subjects wearing light clothes and no shoes or socks, using a weighing balance.
- Height: It was determined using a wall mounted, flexible and non-expansile measuring tape with subjects in standing position and feet together.
- Body mass index (BMI) was calculated using the formula BMI = weight in kg/ height in square meter.
- The blood pressure of the subjects was measured by conventional auscultatory method using a calibrated mercury sphygmomanometer.
- A fasting blood sample was obtained from all subjects for estimation of glucose, total cholesterol, HDL and LDL cholesterol and triglycerides. All the patients were subjected to resting 12 lead electrocardiography.

2D Echocardiography

2D Echo study was performed in all patients. Following views were used in studying the LV -

- 1. Para-sternal long axis view.
- 2. Para-sternal short axis view.
- 3. Apical 4 chamber view/ apical 2 chamber view.
- 4. Subcostal view.

The following 2D Echo parameters were used in examination of the patient -

1. LV internal dimensions -At the end of systole [LVESD]; At the end of Diastole [LVEDD]

2. LV ejection fraction - LVEF [%] = LV diastolic volume – LV systolic volume LV diastolic volume

3. Inter-ventricular septum thickness

4. Detection of wall motion abnormalities.

Treadmill test 82 -We subjected all patients to treadmill stress test, we applied modified Bruce criteria for it.

Definitions

The following definitions were used.

• Asymptomatic - subjects free of cardiovascular symptoms such as chest pain, breathlessness on

exertion, swelling over both lower limbs were selected as asymptomatic subjects.

• Obese - subjects having body mass index more than 30 were considered obese according to WHO definition of obesity.

RESULTS

In our study, out of 50 asymptomatic obese individuals, maximum 18 (36%) were between 41-50 years of age. 12 out of 50 i.e. 24% were between 51-60 years of age. Our study population was female predominant. In our study out of 50, 31 (62%) were females and 19 (38%) were males. In our study out of 50 subjects maximum obese individuals 30 (60%) were in Class 1 obesity, 16 (32%) were in class 2 and 4 (8%) were in Class 3. In present study out of 50 subjects 23 (46%) had hypertension. 24 (48%) had dyslipidemia and 18 (36%) had smoking as a risk factor for coronary artery disease. In our study maximum patients i.e.18 (36%) had normal ECG, low voltage complexes were commonest abnormal finding found in 10 i.e. 20% of the subjects. Left ventricular hypertrophy was seen in 8 (16%) individuals. T-wave inversion was seen in 6 (12%) obese individuals.STflattening and left axis deviation was seen in 4 individuals each i.e. 8% individuals.



Graph 1: 2D Echocardiographic findings in obese individuals In our study, 27 (54%) subjects had normal ECG. Left ventricular hypertrophy was found in 16 (32%) subjects, diastolic dysfunction was found in 5 (10%) subjects and Left ventricular hypertrophy+diastolic dysfunction was found in 2 (4%) subjects.

DISCUSSION

In our study maximum number of obese individuals 18 (36%) were in age group 41-50 years. 51 to 60 years was the next common age group which contained 12 (24%) obese individuals. In a study done by Brown CD *et al*, they found that proportions at the highest BMI level were largest at ages 40 to 59 years.⁴ The CDC just released the latest obesity data from the National Health and Nutrition Examination Survey - the 2011-2012 year. Obesity rates were higher among middle-aged adults (40 to 59-years-

old) than younger adults (20 to 39-year-olds) or older adults (60-years and above).⁵ So, findings in our study correlate with findings in above two studies. In present study out of 50 patients 33 were females and 17 were males. In a study done by Brown CD et al greater proportions of women than men had BMIs at the extremes of the distribution i.e. >25.4 In a study done by Midha T et al, a higher prevalence of obesity was seen in the urban population and in women. so findings in our study correlate with findings in these two studies.⁶ In our study 50 obese individuals were divided into class I, class II and class III obesity according to WHO definition of obesity. Out of 50, 30 individuals (60%) were in class I obesity, 16 (36%) were in class II obesity and 4 (8%) were in class III obesity. It was observed that 27 individuals had normal ECG. Left ventricular hypertrophy was seen in 16 individuals. Diastolic dysfunction was seen in 5 individuals. 2 individuals were having L V hypertrophy and diastolic dysfunction both. Out of 23 hypertensive obese individuals, 14 i.e. 60.86% individuals had left ventricular hypertrophy on 2D- Echo. 2 non hypertensive obese individuals i.e. 7% had LV hypertrophy on 2D-Echo. In a study done by G de Simone et al, 52% hypertensive obese individuals had Left Ventricular Hypertrophy on 2D-Echo. 13% of nonhypertensive obese individuals had LV Hypertrophy on 2D-Echo. Obesity is associated with increased blood viscosity and might, by increasing the peripheral resistance, contribute to the higher LV wall thicknesses and greater prevalence of concentric hypertrophy in these patients.7 In present study diastolic dysfunction was seen in 5 (10%) obese individuals. Out of these 5, 2 had positive treadmill test. In a study done by Fischer et al. prevalence of diastolic dysfunction was 5% in obese individuals and 5% in hypertensive individuals.⁸ Hence, findings in our study correlate with findings in this study. Left ventricular hypertrophy and diastolic dysfunction both were seen in 2 individuals. These two individuals had positive treadmill test.

CONCLUSION

As BMI increases there is increase in incidence of coronary artery disease in asymptomatic obese individuals. So, regular screening by using non-invasive 2D Echocardiography and treadmill test is recommended in these individuals especially those in higher BMI groups to find out latent coronary artery disease.

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